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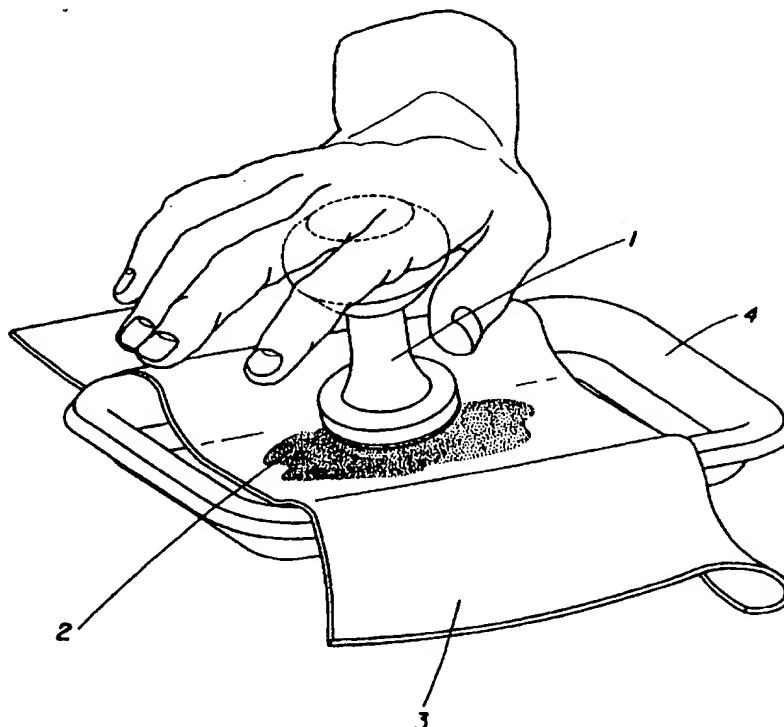


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US97/06998 <b>(22) International Filing Date:</b> 28 April 1997 (28.04.97)  <b>(30) Priority Data:</b> 60/016,686      2 May 1996 (02.05.96)      US  <b>(71) Applicant (for all designated States except US):</b> THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> SIKLOSI, Michael, Peter [US/US]; 7299 Bobby Lane, Cincinnati, OH 45243-2003 (US). HORTEL, Thomas, Charles [US/US]; 5371 Meyers Lane, Blue Ash, OH 45242 (US). HOLT, John, Henry [US/US]; 7853 Anson Drive, North Bend, OH 45052 (US). WISE, Rodney, Mahlon [US/US]; 142 Burns Avenue, Wyoming, OH 45215 (US). LAWYER, John, Virgil [US/US]; 4023 Hubble Road, Cincinnati, OH 45247 (US). GREENE, Cathy, Lynne [US/US]; 6067 Morris Road, Hamilton, OH 45011 (US). WIEDEMANN, Donna, Jane [US/US]; 4056 Mapleridge Drive, West Harrison, IN 47060 (US). JOYCE, Jonathan, Livingston [US/US]; Apartment #1, 3233 Whitfield Avenue, Cincinnati, OH 45220 (US).	<b>(74) Agents:</b> REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).  <b>(81) Designated States:</b> BR, CA, CN, JP, MX, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.          Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	

**(54) Title:** CLEANING DYED FABRICS**(57) Abstract**

Fabrics are cleaned and refreshed in an in-home process with little or no dye transfer by means of cleaning compositions which contain dye fixatives.



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## CLEANING DYED FABRICS

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### FIELD OF THE INVENTION

The present invention relates to compositions and processes which can be used to remove stains from dyed fabrics. The invention is especially useful as part of a dry cleaning operation, but can also be used under any circumstances where spot removal from dyed fabrics is desired.

### CROSS REFERENCE

This application claims priority under Title 35, United States Code 119(e) from Provisional Application Serial No. 60/016,686, filed May 2, 1996.

20

### BACKGROUND OF THE INVENTION

By classical definition, the term "dry cleaning" has been used to describe processes for cleaning textiles using nonaqueous solvents. Dry cleaning is an old art, with solvent cleaning first being recorded in the United Kingdom in the 1860's. Typically, dry cleaning processes are used with garments such as woolens which are subject to shrinkage in aqueous laundering baths, or which are judged to be too valuable or too delicate to subject to aqueous laundering processes. Various hydrocarbon and halocarbon solvents have traditionally been used in immersion dry cleaning processes, and the need to handle and reclaim such solvents has mainly restricted the practice of conventional dry cleaning to commercial establishments.

30

In addition to the cleaning function, dry cleaning also provides important "refreshment" benefits. For example, dry cleaning removes undesirable odors and extraneous matter such as hair and lint from garments, which are then generally folded or pressed to remove wrinkles and restore their original shape. Of course, such refreshment benefits are also afforded by aqueous laundering processes.

35

One type of home dry cleaning system comprises a carrier sheet containing various cleaning agents, and a plastic bag. The garments to be cleaned are placed in the bag

together with the sheet, and then tumbled in a conventional clothes dryer. In a commercial embodiment, multiple single-use flat sheets and a single multi-use plastic bag are provided in a package. Unfortunately, such processes may not satisfactorily remove stains from heavily soiled or "spotted" areas of the fabrics being dry cleaned.

5 As is well known, soiled garments may be "pre-spotted" on localized areas using so-called "spot removal" compositions prior to cleaning or laundering. It has now been discovered that the use of water-based spot removal compositions on stained areas of fabrics can undesirably mobilize, transfer and/or remove dyes therefrom. Accordingly, some "dry-clean only" (DCO) such as silks, rayons, wools and linens are not optimally dry-  
10 cleanable in an in-home process.

By the present invention, compositions and processes are provided which allow the user to remove localized spots from fabrics and/or dry clean entire dyed DCO fabrics, in-home. In a preferred mode, the pre-spotting process is conducted without resort to rubbing by the use of a device which loosens and removes stains via controlled mechanical  
15 action, thereby avoiding fabric damage. Preferred compositions for use in-the-dryer for freshening and reducing malodors sometimes associated with in-the-dryer cleaning processes are also disclosed herein. Such preferred compositions, when used in conjunction with the localized spot removal compositions and processes herein, provide an improved, overall cleaning process which can easily be used in-home.

20

#### BACKGROUND ART

Dry cleaning processes are disclosed in: EP 429,172A1, published 29.05.91, Leigh, et al.; and in U.S. 5,238,587, issued 8/24/93, Smith, et al. Other references relating to dry cleaning compositions and processes, as well as wrinkle treatments for fabrics, include: GB 1,598,911; and U.S. Patents 4,126,563, 3,949,137, 3,593,544, 3,647,354;  
25 3,432,253 and 1,747,324; and German applications 2,021,561 and 2,460,239, 0,208,989 and 4,007,362. Cleaning/pre-spotting compositions and methods are also disclosed, for example, in U.S. Patents 5,102,573; 5,041,230; 4,909,962; 4,115,061; 4,886,615; 4,139,475; 4,849,257; 5,112,358; 4,659,496; 4,806,254; 5,213,624; 4,130,392; and 4,395,261. Sheet substrates for use in a laundry dryer are disclosed in Canadian  
30 1,005,204. U.S. 3,956,556 and 4,007,300 relate to perforated sheets for fabric conditioning in a clothes dryer. U.S. 4,692,277 discloses the use of 1,2-octanediol in liquid cleaners. See also U.S. Patents 3,591,510; 3,737,387; 3,764,544; 3,882,038; 3,907,496; 4,097,397; 4,102,824; 4,336,024; 4,606,842; 4,758,641; 4,797,310; 4,802,997; 4,943,392; 4,966,724; 4,983,317; 5,004,557; 5,062,973; 5,080,822; 5,173,200; EP 0 213  
35 500; EP 0 261 718; G.B. 1,397,475; WO 91/09104; WO 91/13145; WO 93/25654 and

Hunt, D.G. and N.H. Morris, "PnB and DPnB Glycol Ethers", HAPPI, April 1989, pp. 78-82.

### SUMMARY OF THE INVENTION

In the present invention the user is afforded a selection of cleaning compositions which can be chosen for their ability to remove different types of stains and soils without significant dye loss, "mobilization" or transfer (hereinafter "dye transfer"). Thus, a substantially aqueous cleaning composition comprising a cationic dye fixative and various cleaning ingredients is used to remove localized (or overall) soils and stains on dyed fabrics. The user can also employ non-aqueous cleaning compositions, preferably as disclosed hereinafter, to effectively remove oily stains, especially from rayon and polyester fabrics, i.e., a "dual" cleaning system. In an optional mode, the process herein is conducted by first using the non-aqueous cleaning composition, followed by use of the aqueous cleaning composition. In a final step, the fabrics which have been "pre-spotted" can be treated with a water-based composition to provide overall fabric refreshment and to remove malodors.

The invention herein encompasses a composition of matter for cleaning fabrics, comprising:

- (a) an organic cleaning solvent;
- (b) a dye fixative;
- (c) optionally, a deterative surfactant; and
- (d) water.

The organic cleaning solvent is preferably an alkoxyated alkoxy propanol solvent, especially propoxy propoxy propanol, as well as solvents such as butoxy propoxy propanol, and mixtures thereof.

The dye fixative used herein is a cationic material, especially a polycationic material. Dye fixatives are known in the art and are described more fully hereinafter.

A preferred cleaning composition herein, especially in the spot-removal step of the overall process, comprises:

- (a) from about 4% to about 25%, by weight, of propoxy propoxy propanol;
- (b) from about 0.05% to about 2.0%, by weight, of cationic dye fixative;
- (c) optionally, from about 0.05% to about 2.5%, by weight, of a nonionic surfactant which is an ethoxylated alcohol; and
- (d) the balance comprising an aqueous carrier.

The invention also encompasses a method for removing both localized and overall stains and soils from fabrics with the above-disclosed compositions.

The localized spot removal (a.k.a. "pre-spotting") step of the present invention is preferably conducted using a treatment means comprising a spot removal device, especially a device designed for hand-held use, comprising:

- 5 (a) a base member having a convex front treatment face and a rear face oppositely disposed from said treatment face;
- (b) one or more treatment members extending outwardly from said treatment face; and
- (c) optionally, a hand grip affixed to said rear face.

10 A preferred device herein is wherein the front treatment face is substantially hemispherical, or alternatively, inscribes a section of a hemisphere.

In one embodiment of the device, the face has a treatment member which comprises an absorbent material such as a sponge, a pad, or the like. In another embodiment, the treatment member comprises a multiplicity of protrusions, such as bristles. In yet another embodiment of the device, the treatment member comprises a  
15 sponge base having a multiplicity of protrusions extending outwardly therefrom.

In other less preferred embodiments, the treatment means need not be part of the device as noted, but can be simple pads, sheets (e.g., disposable paper toweling), cloth wipes, sponges, or the like, which can be pressed against the stained area of the fabric.

20 The invention also encompasses a method for removing stains from a stained area of fabrics, comprising the steps of:

- (a) applying an aqueous cleaning composition containing a cationic dye fixative to said stained area;
- (b) concurrently or consecutively with Step (a), contacting the stained area of the fabrics with treatment means, preferably using a convex device as noted  
25 above; and
- (c) applying compressive force to the device, especially using a rocking or rolling motion imparted to the device.

30 In an alternate mode, the stained area of the fabric can first be treated with a non-aqueous cleaning composition, preferably using the device herein. The stained area is then treated with the aqueous composition containing the dye fixative.

35 Reference is made to Figure 1. In this mode, the pre-spotting process is shown being conducted on fabric (3) at a discrete stained area (2) which is saturated with the cleaning composition and positioned in a holding tray (4) or other suitable receptacle as a containment system for the cleaning composition. This allows the mechanical agitation afforded by the device (1) to take place in an environment saturated or partially saturated with cleaning composition, akin to a "micro" washing machine.



It is to be understood, however, that, in the pre-spotting step of the process herein, the cleaning compositions can be applied to the fabric by any convenient means, e.g., by spraying, daubing, pouring, and the like, rather than from a carrier sheet. This mode can also conveniently be conducted using a tray or other receptacle according to the following general procedure:

1. Place the stained area of the fabric over an ordinary folded paper towel and tray (paper towel is sitting in the tray).
2. Apply enough cleaning composition from a bottle with a narrow spout which directs the cleaning composition onto the stain (without unnecessarily saturating the surrounding area of the fabric) to saturate the localized stained area - about 10 drops; more may be used for a larger stain.
3. Let the solution penetrate the stain for 3-5 minutes. (This is a pre-treat or pre-hydration step for better cleaning results.)
4. Apply additional cleaning composition - about 10 drops; more may be used for larger stains.
5. Use the spot removal device to work stain completely out. Rock the device firmly for at least 2 minutes, longer for tougher stains. Do not rub the stain with the device.
6. Blot garment between paper towels to remove excess cleaning composition. This helps considerably to minimize residue rings.
7. Conduct the in-dryer cleaning/refreshment process disclosed herein on the entire fabric.

The key benefits in conducting the pre-spotting process in this way are that the pre-hydration step makes cleaning easier (rather like soaking a casserole dish in hot water with dishwashing detergent before trying to clean it), and minimizes ring formation on the fabric.

The invention also encompasses an overall dry cleaning process for treating an entire area of fabric surface, which comprises a prespotting operation according to this invention and comprising the overall steps of:

- (i) conducting a stain removal process according to the above disclosure on localized stained areas of fabric;
- (ii) placing the entire fabric from step (i) together with a carrier containing an aqueous cleaning and/or fabric refreshment composition in a containment bag which is preferably vapor-permeable;

- (iii) placing the bag in a device to provide agitation, e.g., such as in a hot air clothes dryer and operating the dryer with heat and tumbling; and
- (iv) removing the fabric from the bag.

5 While, as noted, the process herein is particularly useful in a stain removal step of a dry cleaning process, it can also be used in a stand-alone stain removal process, or as a stain removal process associated with an otherwise conventional laundering process. Thus, the invention also encompasses an overall laundering process for fabrics which comprises a prespotting operation according to this invention and comprising the overall steps of:

- 10
- (i) conducting a stain removal process according to the above disclosure on localized stained areas of the fabric; and
  - (ii) laundering the entire fabric from step (i) in a conventional aqueous laundering process.

The invention also encompasses a dry cleaning kit, comprising:

- 15
- (a) an aqueous cleaning and/or fabric refreshment composition which is, optionally, releasably contained on a carrier substrate;
  - (b) a re-usable containment bag;
  - (c) optionally, a fabric cleaning device, as disclosed herein,
  - (d) optionally, a re-usable holding tray; and
  - 20 (e) optionally, a non-aqueous cleaning composition.

All percentages, ratios and proportions herein are by weight, unless otherwise specified. All documents cited are, in relevant part, incorporated herein by reference.

#### BRIEF DESCRIPTION OF THE DRAWINGS

25 Figure 1 is a perspective of the present process using a convex device to spot treat stains using hand pressure. In this procedure, a holding tray is placed beneath the fabric being treated and a sheet substrate releasably containing a cleaning composition is placed in the tray. The fabric being treated is then placed over the sheet substrate and the device is rocked back and forth on the stained area. A portion of the cleaning composition is released from the sheet substrate into and through the stained area of the fabric. The  
30 treatment members on the treatment face of the device gently, but effectively, work in combination with the cleaning composition to loosen and remove the stain from the fabric. This same procedure is followed with both the non-aqueous and aqueous cleaning compositions used in the "dual" process disclosed herein.

### DETAILED DESCRIPTION OF THE INVENTION

The components of the compositions, processes and devices of this invention and their method of use are described in more detail hereinafter. Such disclosure is by way of illustration and not limitation of the devices and their uses.

5 By "aqueous" cleaning compositions herein is meant compositions which comprise a major portion of water, plus the cationic dye fixative, cleaning solvents, surfactants, and the like, especially those disclosed hereinafter.

By "non-aqueous" cleaning compositions herein is meant compositions which primarily comprise an organic solvent, with little or no water present.

10 By "cleaning" herein is meant compositions which are directed, in the main, to removing soils and stains from fabrics. By "refreshment" herein is meant compositions which, in the main, serve to remove malodors and/or wrinkles from the fabrics, or otherwise improve their overall appearance, other than primarily to remove soils and stains. In general, the fabric refreshment compositions will typically comprise more water (95-  
15 99.9%, preferably greater than 95% up to about 99%) and fewer cleaning ingredients than the cleaning compositions herein.

By "protuberances" herein is meant knobs, fibers, bristles or like structures which extend outwardly from the surface of the treatment device. Such elements of the device come into contact with the fabric being spot-cleaned ("pre-spotted") to provide the  
20 mechanical cleaning action.

By "contact with stained areas" is meant contact which is afforded by impingement of the protuberances, pads, sponges, etc., which comprise the treatment means or device with the stained area. It is highly desirable that this contact result in a force which is directed substantially downward, i.e., in the Z-direction substantially perpendicular to the  
25 surface of the stain, rather than a side-to-side scrubbing motion in the X- and Y-directions, to minimize fabric damage or "wear". Preferably, the contact is associated with a rocking or rolling motion by the device, whereby the curved surface of the device imparts the force in the Z-direction.

Cleaning Compositions - The chemical compositions which are used to provide the  
30 cleaning function in the present device and process comprise ingredients which are safe and effective for their intended use. Since the dry cleaning process herein does not involve an aqueous rinse step, the cleaning compositions employ ingredients which do not leave undesirable residues on fabrics when employed in the manner disclosed herein. While  
35 conventional laundry detergents are typically formulated to provide good cleaning on cotton and cotton/polyester blend fabrics, the cleaning compositions herein must be

formulated to also safely and effectively clean and refresh fabrics such as wool, silk, rayon, rayon acetate, and the like.

5 In addition, the cleaning compositions herein comprise ingredients which are specially selected and formulated to minimize dye removal or migration from the stain site of fugitive, unfixed dye from the fabrics being cleaned. In this regard, it is recognized that the solvents typically used in immersion dry cleaning processes can remove some portion of certain types of dyes from certain types of fabrics. However, such removal is tolerable in immersion processes since the dye is removed relatively uniformly across the surface of the fabric. In contrast, it has now been determined that high concentrations of certain  
10 types of cleaning ingredients at specific sites on fabric surfaces can result in unacceptable localized dye removal. The preferred cleaning compositions herein are formulated to minimize or avoid this problem.

The dye removal attributes of the present cleaning compositions can be compared with art-disclosed cleaners using photographic or photometric measurements, or by means  
15 of a simple, but effective, visual grading test. Numerical score units can be assigned to assist in visual grading and to allow for statistical treatment of the data, if desired. Thus, in one such test, a colored garment (typically, silk, which tends to be more susceptible to dye loss than most woolen or rayon fabrics) is treated by padding-on cleaner using an absorbent, white paper hand towel. Hand pressure is applied, and the amount of dye which  
20 is transferred onto the white towel is assessed visually. Numerical units ranging from: (1) "I think I see a little dye on the towel"; (2) "I know I see some dye on the towel"; (3) I see a lot of dye on the towel"; through (4) "I know I see quite a lot of dye on the towel" are assigned by panelists.

In addition to the foregoing considerations, the cleaning compositions used herein  
25 are preferably formulated such that they are not so adhesive in nature that they render the spot-cleaning device unhandy or difficult to use. However, and while not intending to be limiting of the present invention, the preferred cleaning compositions disclosed herein afford a spot-cleaning process which is both effective and aesthetically pleasing when used with a device according to this invention.

30 Having due regard to the foregoing considerations, the following illustrates the ingredients used in the dry cleaning compositions herein, but is not intended to be limiting thereof.

#### Aqueous Compositions

35 (a) Cationic Dye Fixative - The cleaning compositions herein will preferably comprise at least about 0.05%, by weight, of a cationic dye fixative. Such

dye fixatives are complex, often ill-characterized, cationic (or polycationic) materials, many of which are known commercially, as disclosed hereinafter.

- (b) Solvent - The cleaning compositions will preferably comprise at least about 4%, typically from about 5% to about 25%, by weight, of solvent. The objective is to provide at least about 0.4 g, preferably from about 0.5 g to about 2.5 g, of solvent per kg of fabrics being cleaned.
- (c) Water - The cleaning compositions will comprise at least about 60%, typically from about 80% to about 95%, by weight, of water. Stated otherwise, the objective is to provide at least about 6 g of water per kg of fabrics being cleaned.
- (d) Optionals - The cleaning compositions herein may comprise various optional ingredients, including perfumes, conventional surfactants, and the like. If used, such optional ingredients will typically comprise from about 0.1% to about 10%, by weight, of the compositions, having due regard for residues on the cleaned fabrics.

Cationic Dye Fixatives - Dye fixing agents, or "fixatives", are well-known, commercially available materials which are designed to improve the wash fastness of fabric dyes by minimizing the loss or migration of dye from fabrics.

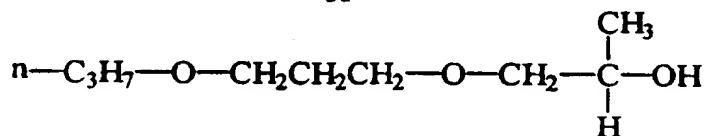
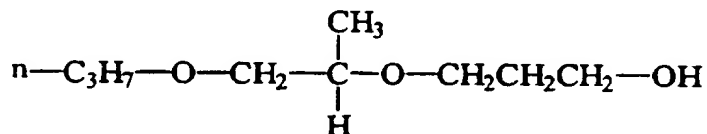
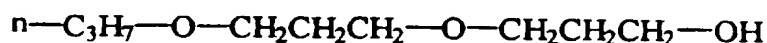
Many dye fixatives are cationic, and are based on various quaternized or otherwise cationically charged organic nitrogen compounds. Fixatives are available under various trade names from several suppliers. Representative examples include: CROSCOLOR PMF (July 1981, Code No. 7894) and CROSCOLOR NOFF (January 1988, Code No. 8544) from Crosfield; INDOSOL E-50 (February 27, 1984, Ref. No. 6008.35.84; polyethyleneamine-based) from Sandoz; SANDOFIX TP, a polyaminoether resin from Sandoz, see Product Bulletin 5 - 193/89; SANDOFIX WE LIQUID, see Product Bulletin 5-306/76; SANDOFIX TPS, which is also available from Sandoz; and SANDOFIX SWE, See Product Bulletin 5-022/92.

Other cationic dye fixing agents are described in "Aftertreatments for improving the fastness of dyes on textile fibres" by Christopher C. Cook (REV. PROG. COLORATION Vol. 12, 1982). Other dye fixing agents suitable for use in the present invention are ammonium compounds such as fatty acid - diamine condensates, e.g., the hydrochloride acetate, metosulphate and benzyl hydrochloride of oleyldiethyl aminoethylamide, oleylmethyl-diethylenediaminemethsulphate, monostearyl-ethylene diaminotrimethylammonium methosulphate and oxidised products of tertiary amines; derivatives of polymeric alkyl diamines, polyamine-cyanuric chloride condensates and aminated glycerol dichlorohydrins.

Such dye fixatives will be employed at levels of at least about 0.05%, typically from about 0.13% to about 0.2%, of the cleaning compositions herein.

In an optional but somewhat less preferred mode, the cationic dye fixatives noted above can be replaced in the preferred compositions herein by ethoxylated and modified polyamines such as those disclosed in: U.S. Patent 4,548,744, Connor, Oct. 22, 1985; U.S. Patents 4,597,898, July 1, 1986 and 4,891,160, Jan. 2, 1990, both to VanderMeer; and WO 95/32272, published Nov. 30, 1995.

Organic Solvent - A preferred cleaning solvent herein is propoxy propoxy propanol (PPP) which is available in commercial quantities as a mixture of isomers in about equal amounts. The isomers, and mixtures thereof, are useful herein. The isomer structures are as follows:



PPP is outstanding for cleaning. Moreover, it allows for the formulation of effective cleaning compositions herein without the use of conventional surfactants. PPP is sufficiently miscible in water (~18%) that no emulsifier is needed to prepare homogeneous, water-based cleaning compositions in stable liquid form. (This is in contrast with BPP solvent and mixtures of BPP and 1,2-octanediol which require an emulsifier, e.g., PEMULEN®, to prepare aqueous emulsions.) Importantly, the odor of PPP is of a degree and character that it can be relatively easily masked by conventional perfume ingredients. The PPP solvent used herein is preferably a mixture of the aforesaid isomers.

While the cleaning compositions herein function quite well with only the PPP and water, they may also optionally contain deterative surfactants to further enhance their cleaning performance. A wide variety of deterative surfactants such as the C<sub>12</sub>-C<sub>16</sub> ethoxylated (EO 0.5-10 avg.) alcohols, the C<sub>12</sub>-C<sub>14</sub> N-methyl glucamides, and C<sub>12</sub> dimethyl amine oxide, can be used herein. If used, such surfactants will typically comprise from about 0.05% to about 2.5%, by weight, of the cleaning compositions herein.

Optionals - In addition to the preferred solvents disclosed above, the cleaning compositions herein may comprise various optional ingredients, such as perfumes, preservatives, co-solvents, brighteners, salts for viscosity control, pH adjusters or buffers,

softeners, colorants, mothproofing agents, insect repellents, bleaches and the like. Enzymes such as proteases, amylases, lipases and mixtures thereof can also be used at levels from about 0.0001% to about 1% of the compositions. The following illustrates preferred ranges for cleaning compositions for use herein, but is not intended to be limiting thereof.

<u>Ingredient</u>	<u>% (wt.) Formula Range</u>
Dye Fixative	0.05-2.0%
PPP*	5-25%
Neodol 23-6.5**	0.1-2.5%
Perfume	0.01-1.5%
Water	Balance

pH range from about 6 to about 8.

\*Other cleaning solvents or co-solvents which can be used herein include various glycol ethers, including materials marketed under trademarks such as Carbitol, methyl Carbitol, butyl Carbitol, propyl Carbitol, and hexyl Cellosolve, and especially methoxy propoxy propanol (MPP), ethoxy propoxy propanol (EPP), butoxy propoxy propanol (BPP), and all isomers and mixtures, respectively, of MPP, EPP, and BPP, and the like, and mixtures thereof. Indeed, although somewhat less preferred, the MPP, EPP and BPP, respectively, can replace at least part of the PPP solvent in the foregoing cleaning compositions. The usage levels of these solvents, are the same as with the preferred PPP solvent. If desired, and having due regard for safety and odor for in-home use, various conventional chlorinated and hydrocarbon dry cleaning solvents may also be used. Included among these are 1,2-dichloroethane, trichloroethylene, isoparaffins, and mixtures thereof.

\*\*C<sub>12</sub>-C<sub>13</sub> alcohol average ethoxylate (EO) 6.5; trademark Shell.

Non-aqueous Compositions - The non-aqueous cleaning compositions optionally used herein can comprise any of the foregoing organic solvents and mixtures thereof, or other organic solvents which are known for use in spot removal and/or dry cleaning processes. A preferred non-aqueous cleaning composition comprises PPP and mixtures of PPP and butoxy propanol (BP) at a weight ratio of PPP:BP in the range from about 10:1 to about 1:10, most preferably 9 PPP:1 BP. The non-aqueous cleaning compositions herein are formulated without the use of water. While some water may be introduced into the non-aqueous compositions, this will mainly occur as a result of trace contamination of the organic solvents. In general, the non-aqueous cleaning compositions herein will be "substantially free" of water, i.e., will contain less than about 5%, preferably less than about 1%, most preferably 0%, by weight, of water.

Fabric Refreshment Compositions - The use of fabric refreshment compositions herein is based on the discovery that the presence of low molecular weight organic solvents used in a containment bag can actually inhibit the ability to remove malodors from garments with an in-dryer product as a dry cleaning alternative. In this aspect of the invention, the garments are placed in a carrier bag of reasonable gas permeability or porosity along with a carrier sheet (preferably non-woven fabric) wetted with about 10 to about 100 g of a water-based refreshment composition. Water vapor fills the bag as it is tumbled in a heated dryer, and this vapor leaves the bag, apparently carrying with it the malodor components which are also heat-volatilized. Moistening of garments by sheet contact and condensing vapors also appears to enhance odor improvement.

The presence of water-immiscible organic solvents or other volatilizing ingredients on the carrier sheet will inhibit malodor removal. Accordingly, all other ingredients should be water-miscible, with the exception of a low amount of perfume (preferably less than 0.5%). A small amount of surfactant (< about 2%) is also useful as a perfume dispersant and as a wetting agent for fabric and malodor soils. In total, water is at least 95% of the composition. Low molecular weight alcohols such as ethanol or isopropanol can be used in the composition to assist in transferring malodors and soils to the carrier sheet due to solvent action during contact between the wetted sheet and malodor or soil components. This contact can occur during the tumbling in the dryer or through direct contact moistening of fabric by the wetted sheet prior to inclusion in the bag.

In this manner, dry-clean type fine garments can be refreshed and made wearable again by treatment in a bag in a heated dryer. Cigarette smoke can be removed to trace or non-detectable levels without any perfume cover in only about an hour. Body odors can be mostly removed, with the less volatile residues easily covered using low perfume levels on the carrier sheet. Volatile and non-volatile stains and malodors can be concentrated on the carrier as a scavenger, which is then discarded.

Preferred fabric refreshment compositions herein are as follows.

<u>Ingredient</u>	<u>% (wt.)</u>	<u>Range (% wt.)</u>
Water	99.0	95.1-99.99
Perfume	0.5	0.05-1.5
Surfactant*	0.5	0.05-2.0
Ethanol or Isopropanol	0	Optional to 4%

\*Especially ethoxylated alcohols, as disclosed herein. The fabric refreshment compositions may also contain anionic surfactants. Such anionic surfactants are well-known in the detergency arts. Commercial surfactants available as TWEEN®, SPAN®, AEROSOL OT® and various sulfosuccinic esters are especially useful herein.



Carrier - When used in a dry cleaning operation of the present type, the foregoing cleaning and/or refreshment compositions are conveniently used in combination with a carrier, such that the compositions perform their function as the surfaces of the fabrics come in contact with the surface of the carrier. The carrier releasably contains the compositions. By "releasably contains" means that the compositions are effectively released from the carrier onto the soiled fabrics as part of the spot removal, dry cleaning and/or fabric refreshment processes herein.

The carrier can be in any desired form, such as powders, flakes, shreds, and the like. However, it will be appreciated that such comminuted carriers would have to be separated from the fabrics at the end of the process. Accordingly, it is highly preferred that the carrier be in the form of an integral pad or sheet which substantially maintains its structural integrity throughout the process. Such pads or sheets can be prepared, for example, using well-known methods for manufacturing non-woven sheets, paper towels, fibrous batts, cores for bandages, diapers and catamenials, and the like, using materials such as wood pulp, cotton, rayon, polyester fibers, and mixtures thereof. Woven cloth pads may also be used, but are not preferred over non-woven pads due to cost considerations. Integral carrier pads or sheets may also be prepared from natural or synthetic sponges, foams, and the like.

The carriers are designed to be safe and effective under the intended operating conditions of the present process. The carriers must not be flammable during the process, nor should they deleteriously interact with the cleaning or refreshment composition or with the fabrics being cleaned. In general, non-woven polyester-based pads or sheets are quite suitable for use as the carrier herein.

The carrier used herein is most preferably non-linting. By "non-linting" herein is meant a carrier which resists the shedding of visible fibers or microfibers onto the fabrics being cleaned, i.e., the deposition of what is known in common parlance as "lint". A carrier can easily and adequately be judged for its acceptability with respect to its non-linting qualities by rubbing it on a piece of dark blue woolen cloth and visually inspecting the cloth for lint residues.

The non-linting qualities of sheet or pad carriers used herein can be achieved by several means, including but not limited to: preparing the carrier from a single strand of fiber; employing known bonding techniques commonly used with nonwoven materials, e.g., point bonding, print bonding, adhesive/resin saturation bonding, adhesive/resin spray bonding, stitch bonding and bonding with binder fibers. In an alternate mode, a carrier can be prepared using an absorbent core, said core being made from a material which, itself, sheds lint. The core is then enveloped within a sheet of porous, non-linting material having

a pore size which allows passage of the cleaning or refreshment compositions, but through which lint from the core cannot pass. An example of such a carrier comprises a cellulose or polyester fiber core enveloped in a non-woven polyester scrim.

5 The carrier should be of a size which provides sufficient surface area that effective contact between the surface of the carrier and the surface of the fabrics being treated is achieved. Of course, the size of the carrier should not be so large as to be unhandy for the user. Typically, the dimensions of the carrier will be sufficient to provide a macroscopic surface area (both sides of the carrier) of at least about 360 cm<sup>2</sup>, preferably in the range from about 360 cm<sup>2</sup> to about 3000 cm<sup>2</sup>. For example, a rectangular carrier may have the  
10 dimensions (X-direction) of from about 20 cm to about 35 cm, and (Y-direction) of from about 18 cm to about 45 cm. Two or more smaller carrier units can be used when a larger surface area is desired (or needed).

The carrier is intended to contain a sufficient amount of the cleaning or refreshment compositions to be effective for their intended purpose. The capacity of the carrier for  
15 such compositions will vary according to the intended usage. For example, pads or sheets which are intended for a single use will require less capacity than such pads or sheets which are intended for multiple uses. For a given type of carrier the capacity for the cleaning or refreshment composition will vary mainly with the thickness or "caliper" (Z-direction; dry basis) of the sheet or pad. For purposes of illustration, typical single-use polyester sheets  
20 used herein will have a thickness in the range from about 0.1 mm to about 0.7 mm and a basis weight in the range from about 30 g/m<sup>2</sup> to about 100 g/m<sup>2</sup>. Typical multi-use polyester pads herein will have a thickness in the range from about 0.2 mm to about 1.0 mm and a basis weight in the range from about 40 g/m<sup>2</sup> to about 150 g/m<sup>2</sup>. Open-cell sponge sheets will range in thickness from about 0.1 mm to about 1.0 mm. Of course, the  
25 foregoing dimensions may vary, as long as the desired quantity of the cleaning or refreshment composition is effectively provided by means of the carrier.

A preferred carrier herein comprises a binderless (or optional low binder), hydroentangled absorbent material, especially a material which is formulated from a blend of cellulosic, rayon, polyester and optional bicomponent fibers. Such materials are  
30 available from Dexter, Non-Wovens Division, The Dexter Corporation as HYDRASPUN<sup>®</sup>, especially Grade 10244. The manufacture of such materials forms no part of this invention and is already disclosed in the literature. See, for example, U.S. Patents 5,009,747, Viazmensky, et al., April 23, 1991 and 5,292,581, Viazmensky, et al., March 8, 1994, incorporated herein by reference. Preferred materials for use herein have  
35 the following physical properties.

Grade

Optional

	<u>10244</u>	<u>Targets</u>	<u>Range</u>
Basis Weight	gm/m <sup>2</sup>	55	35-75
Thickness	microns	355	100-1500
Density		gm/cc	0.155 0.1-0.25
5 Dry Tensile	gm/25 mm		
MD		1700	400-2500
CD		650	100-500
Wet Tensile	gm/25 mm		
MD*		700	200-1250
10 CD*		300	100-500
Brightness	%	80	60-90
Absorption Capacity	%	735	400-900 (H <sub>2</sub> O)
Dry Mullen	gm/cm <sup>2</sup>	1050	700-1200

\*MD - machine direction; CD - cross direction

15 As disclosed in U.S. 5,009,747 and 5,292,281, the hydroentangling process provides a nonwoven material which comprises cellulosic fibers, and preferably at least about 5% by weight of synthetic fibers, and requires less than 2% wet strength agent to achieve improved wet strength and wet toughness.

20 Surprisingly, this hydroentangled carrier is not merely a passive absorbent for the cleaning and/or refreshment compositions herein, but actually optimizes cleaning performance. While not intending to be limited by theory, it may be speculated that this carrier is more effective in delivering the compositions to soiled fabrics. Or, this particular carrier might be better for removing soils by contact with the soiled fabrics, due to its mixture of fibers. Whatever the reason, improved dry cleaning performance is secured.

25 In addition to the improved performance, it has now been discovered that this hydroentangled carrier material provides an additional, unexpected benefit due to its resiliency. In-use, the sheets herein are designed to function in a substantially open configuration. However, the sheets may be packaged and sold to the consumer in a folded configuration. It has been discovered that carrier sheets made from conventional materials  
30 tend to undesirably revert to their folded configuration in-use. This undesirable attribute can be overcome by perforating such sheet, but this requires an additional processing step. It has now been discovered that the hydroentangled materials used to form the carrier sheet herein do not tend to re-fold during use, and thus do not require such perforations (although, of course, perforations may be used, if desired). Accordingly, this newly-  
35 discovered and unexpected attribute of the carrier materials herein makes them optimal for use in the manner of the present invention.

Controlled Release Carriers - Other carriers which can be used in the present invention are characterized by their ability to absorb liquid cleaning compositions, and to release them in a controlled manner. Such carriers can be single-layered or multi-layer laminates. In one embodiment, such controlled-release carriers can comprise the  
5 absorbent core materials disclosed in U.S. Patent 5,009,653, issued April 23, 1991, to T. W. Osborn III, entitled "Thin, Flexible Sanitary Napkin", assigned to The Procter & Gamble Company, incorporated herein by reference. Another specific example of a controlled-release carrier herein comprises a hydroentangled web of fibers (as disclosed above) having particles of polymeric gelling materials dispersed, either uniformly or non-  
10 uniformly, in the web. Suitable gelling materials include those disclosed in detail at columns 5 and 6 of Osborn, as well as those disclosed in U.S. 4,654,039, issued March 31, 1987, to Brandt, Goldman and Inglin. Other carriers useful herein include WATER-LOCK® L-535, available from the Grain Processing Corporation of Muscatine, Iowa. Non-particulate superabsorbents such as the acrylate fibrous material available under the  
15 tradename LANSEAL F from the Choli Company of Higashi, Osaka Japan and the carboxymethylcellulose fibrous material available under the tradename AQUALON C from Hercules, Inc., of Wilmington, Delaware can also be used herein. These fibrous superabsorbents are also convenient for use in a hydro-entangled-type web.

In another embodiment the controlled release carrier can comprise absorbent batts  
20 of cellulosic fibers or multiple layers of hydroentangled fibers, such as the HYDRASPUN sheets noted above. In this embodiment, usually 2 to about 5 sheets of HYDRASPUN, which can optionally be spot-bonded or spot-glued to provide a coherent multi-layered structure, provides an absorbent carrier for use herein without the need for absorbent gelling materials, although such gelling materials can be used, if desired. Other useful  
25 controlled release carriers include natural or synthetic sponges, especially open-cell polyurethane sponges and/or foams. Whatever controlled release carrier is selected, it should be one which imbibes the liquid cleaning compositions herein thoroughly, yet releases them with the application of pressure or heat. Typically, the controlled release carriers herein will feel wet or, preferably, somewhat damp-to-nearly dry to the touch, and  
30 will not be dripping wet when carrying 10-30 g. of the cleaning composition.

Coversheet - In an optional embodiment, a liquid permeable coversheet is superimposed over the carrier. In one embodiment, the coversheet is associated with the carrier by spray-gluing the coversheet to the surface of the carrier. The coversheet is preferably a material which is compliant and soft feeling. Further, the coversheet is liquid  
35 and/or vapor pervious, permitting the cleaning composition to transfer through its thickness. A suitable coversheet may be manufactured from a wide range of materials

such as polymeric materials, formed thermoplastic films, apertured plastic films, porous films, reticulated foams, natural fibers (e.g., wood or cotton fibers), woven and non-woven synthetic fibers (e.g., polyester or polypropylene fibers) or from a combination of natural and synthetic fibers, with apertured formed films being preferred. Apertured formed films are preferred for the coversheet because they are pervious to the liquid cleaning and/or refreshment compositions (or vapors) and yet non-absorbent. Thus, the surface of the formed film which is in contact with the fabrics remains relatively dry, thereby further reducing water spotting and dye transfer. Suitable formed films are described in U.S. Pat. No. 3,929,135, entitled "Absorptive Structure Having Tapered Capillaries", issued to Thompson on December 30, 1975; U.S. Pat. No. 4,324,246, entitled "Disposable Absorbent Article Having A Stain Resistant Coversheet", issued to Mullane and Smith on April 13, 1982; U.S. Pat. No. 4,342,314, entitled "Resilient Plastic Web Exhibiting Fiber-Like Properties", issued to Radel and Thompson on August 3, 1982; and U.S. Pat. No. 4,463,045, entitled "Macroscopically Expanded Three-Dimensional Plastic Web Exhibiting Non-Glossy Visible Surface and Cloth-Like Tactile Impression", issued to Ahr, Louis, Mullane and Ouellete on July 31, 1984, all of which are incorporated herein by reference.

In a preferred embodiment of the present invention, the outer and/or inner surfaces of the coversheet are hydrophilic. The surfaces of the coversheet can be made hydrophilic by treatment with a surfactant which is substantially evenly and completely distributed throughout the surface of the coversheet. This can be accomplished by any of the common techniques well known to those skilled in the art. For example, the surfactant can be applied to the coversheet by spraying, by padding, or by the use of transfer rolls. Further, the surfactant can be incorporated into the polymeric materials of a formed film coversheet. Such methods are disclosed in U.S. 5,009,653, cited above.

Spot Removal Devices - The devices which are optionally, but preferably, used in the pre-spotting operation herein can be manufactured by injection molding using polymers such as low- and high-density polyethylene, polypropylene, nylon-6, nylon-6,6, acrylics, acetals, polystyrene, polyvinyl chloride, and the like. High density polyethylene and polypropylene are within this range and are preferred for use herein.

The treatment members on the devices herein can comprise natural or synthetic bristles, natural or synthetic sponges, absorbent pads such as cotton, rayon, regenerated cellulose, and the like, as well as the HYDRASPUN® fabric described hereinabove. Various useful materials are all well-known in the cleaning arts in conventional brushes and toothbrushes (see U.S. Patent 4,637,660) and in various cleaning utensils. Sponges, pads, and the like will typically have a thickness of from about 1 mm to about 1.25 cm and can be glued to the convex front treatment face of the device. Preferably, the sponges,

pads, bristled pads, etc., are typically co-extensive with substantially the entire treatment face.

5 The protuberances herein can be in the form of blunt or rounded bristles, which may be provided uniformly across the entire treatment face or in clusters. The protuberances can be in the form of monofilament loops, which can be circular, ovoid or elongated, or can be cut loops. The protuberances can comprise twisted fiber bundles, extruded nubs, molded finger-like appendages, animal hair, reticulated foams, rugosities molded into the face of the member, and the like. Protuberances made from monofilament fibers may be straight, twisted or kinked.

10 In one embodiment, the treatment member can comprise multiple components. In particular, the treatment member can comprise an absorbent base material which can be, for example, a natural or synthetic sponge, an absorbent cellulosic sheet or pad, or the like. In contact with and extending outward from this base material are multiple protrusions as disclosed above. A specific example of this embodiment is a treatment member  
15 comprising multiple looped protuberances made from monofilament fibers which protrude from a sponge base layer. In this embodiment, the absorbent base layer acts as a reservoir which feeds cleaning composition to the protuberances.

In various optional modes, the treatment members present on the convex face of the device herein can comprise a multi-layer composite comprising a sponge-like, resilient  
20 backing material for a fibrous layer having multiple fibrous elements extending outwardly therefrom. Such composites can be permanently or semi-permanently affixed to the treatment members using glue or other conventional means, and, typically, are substantially co-extensive with the face of the treatment member. Such composites can be made from conventional materials, e.g., using a sponge, foam or other absorbent base pad material  
25 from about 0.5-20 mm thickness and a layer of fibers such as a conventional painter's pad with fibers having a length of from about 0.05 mm to about 20 mm.

The protuberances herein are typically provided as a bed or mat which comprises multiple strands or loops which extend therefrom in the Z-direction. Convenient and familiar sources include pile carpet-type materials, paint pad-type materials, and the like.  
30 In such embodiments, the treatment member will comprise several thousand protuberances per  $\text{cm}^2$ . With the preferred looped protuberances herein, there will typically be 10-500, preferably about 60-150, loops per  $\text{cm}^2$ . The choice of the source, style and number of protuberances are matters for the manufacturer's discretion, and the foregoing illustrations are not intended to be limiting of the invention.

35 The protuberances should preferably extend outwardly from the face of the treatment member for a distance of at least about 0.2 mm. While there is no upper limit to

their length, there is essentially no functional reason for the protuberances to extend more than about 1.25 cm.

The protuberances can be made from plastic, rubber or any other convenient, resilient material which is stable in the presence of the cleaning composition. Fibrous protrusions can be made from natural or synthetic fibers. Fiber diameters can typically range from 0.1 mil (0.0025 mm) to 20 mil (0.5 mm). Again, this is a matter of selection and is not intended to be limiting.

In one embodiment, the protuberances are in the form of a multiplicity of stiffened, ovoid looped fibers which extend outwardly from the treatment face. Such looped fibers can comprise, for example, 7 mil (0.18 mm) monofilament loops of polypropylene extending at least about 0.03 inch (0.76 mm), typically from about 2.0 mm to about 1.5 cm, outwardly from the face of a backing material. The diameter of the loops at their widest point is about 1.3 mm. A convenient material for said looped protrusions is available commercially from APLIX Inc., Number 200, Unshaved Loop, Part No. DM32M000-QY. This material comprises a nylon backing with about 420 loops per square inch (65 loops per  $\text{cm}^2$ ) extending from its surface.

It will be appreciated that the devices herein can be made from a variety of plastic, glass, wood, etc. materials and with various overall shapes, decorations and the like, according to the desires of the manufacturer. Of course, the devices are preferably made from materials which will not be affected by the various ingredients used in the cleaning compositions. The size of the devices is entirely optional. It is contemplated that rather large devices (e.g. 200-1000  $\text{cm}^2$  convex treatment face) would be suitable for mounting and use in a commercial cleaning establishment. For in-home use, the device is intended for hand-held use, and its dimensions are generally somewhat smaller; typically, the surface area of the convex treatment face for home use will be in the range of from about 10  $\text{cm}^2$  to about 200  $\text{cm}^2$ . While the convex treatment faces illustrated herein are, mainly, sections of spheres, the convex face of the device can also be in the manner of a desk-style ink blotter. Stated otherwise, the front treatment face of the device can be outwardly curved over its operational plane, but flat along its sides.

While the surface area of the treatment members can be adjusted according to the desires of the manufacturer, it is convenient for a hand-held, home-use device to have a treatment face whose surface area is in the range from about 25  $\text{cm}^2$  to about 70  $\text{cm}^2$ .

Containment Bag - The construction of the preferred, heat-resistant flexible bag used herein to contain the fabrics in a hot air laundry dryer or similar device preferably employs thermal resistant films to provide the needed temperature resistance to internal self-sealing and external surface deformation sometimes caused by overheated clothes

dryers. In addition, the bags are resistant to the chemical agents used in the cleaning or refreshment compositions herein. By proper selection of bag material, unacceptable results such as bag melting, melted holes in bags, and sealing of bag wall-to-wall are avoided. In a preferred mode, the closure means for the bag is also constructed of a thermal resistant material. In one mode, the bags can be substantially impermeable to water vapor and to the vapors from the cleaning and/or refreshment compositions. In a preferred mode (disclosed hereinafter) the bags are designed to release such vapors.

The dimensions of the containment bag can vary, depending on the intended end-use. For example, a bag can be provided which is sufficient to contain one or two silk blouses. Alternatively, a bag suitable for handling a man's suit can be provided. Typically, the bags herein will have an internal volume of from about 10,000 cm<sup>3</sup> to about 25,000 cm<sup>3</sup>. Bags in this size range are sufficient to accommodate a reasonable load of fabrics (e.g., 1-5 kg) without being so large as to block dryer vents.

The bag herein is preferably flexible, yet is preferably durable enough to withstand multiple uses. Typically, such bags are prepared from 0.025 mm to 0.075 mm (1-3 mil) thickness polymer sheets. If some rigidity in the bag is desired, somewhat thicker sheets can be used.

In a preferred embodiment, a 1-3 mil nylon film is sealed into a 26 inch (66 cm) x 30 in. (76 cm) bag. Sealing is preferably done using standard impulse heating equipment. In an alternate mode, a sheet of nylon is simply folded in half and sealed along two of its edges. In yet another mode, bags can be made by air blowing operations.

In addition to thermally stable "nylon-only" bags, the containment bags herein can also be prepared using sheets of co-extruded nylon and/or polyester or nylon and/or polyester outer and/or inner layers surrounding a less thermally suitable inner core such as polypropylene. In an alternate mode, a bag is constructed using a nonwoven outer "shell" comprising a heat-resistant material such as nylon or polyethylene terephthalate and an inner sheet of a polymer which provides a vapor barrier. The non-woven outer shell protects the bag from melting and provides an improved tactile impression to the user. Whatever the construction, the objective is to protect the bag's integrity under conditions of thermal stress at temperatures up to at least about 400-500°F (204°C to 260°C). Under circumstances where excessive heating is not of concern, the bag can be made of polyester, polypropylene or any convenient polymer material.

The preferred bag herein is designed to vent water vapor during the dryer stage of the present process. In order to achieve this, the walls of bags which are made from polymer sheet stock can be provided with slits, holes (preferred) or the like to provide means for the venting to occur. This can be simply, yet effectively, achieved by punching



holes in the walls of the bag using any convenient instrument. In a typical mode, 6-15 pairs of 0.2 cm-0.6 cm holes are uniformly punched in the walls of a substantially rectangular bag having a total volume of about 25,000 cm<sup>3</sup>. This provides adequate venting in the process herein. In another mode, a series of longitudinal slits are cut in the walls of the bag. In yet another mode, the mouth of the bag is designed to be only partially closed during use.

In an alternate embodiment, venting can be achieved by using containment bags which are constructed from woven or non-woven fabrics, rather than from sheet-form polymers. This allows the vapors to penetrate directly from the bag through the pores and void spaces which are inherently present in the walls of the bag. Thus, bags made from nylon, polyester, cotton, rayon, and the like, fibers using conventional weaving processes or processes for making fibrous, non-woven articles can be employed herein.

In still another mode, the bags can be manufactured from porous paper in which holes can optionally be punched to provide vapor release during the present process.

Stain Removal and Wet Cleaning Process - The pre-spotting process herein can be used in a spot removal pre-treatment step of a conventional laundering process. Thus, the stained area is first treated in the manner herein until the stain is loosened or substantially removed. The entire fabric can then be laundered in an aqueous bath, in the conventional manner.

Suitable detergent compositions for use in the laundering step of a wet cleaning process typically comprise one or more deterative surfactants such as the C<sub>12</sub>-C<sub>14</sub> alkyl benzene sulfonates, C<sub>10</sub>-C<sub>18</sub> alkyl sulfates, C<sub>10</sub>-C<sub>18</sub> ethoxylated alcohols, C<sub>10</sub>-C<sub>18</sub> alkylethoxy sulfates, C<sub>12</sub>-C<sub>18</sub> polyhydroxy fatty acid amides, and the like. Such compositions may also comprise builders, such as zeolites, phosphates, citrate, and the like. Other ingredients such as deterative enzymes, percarbonate or perborate bleaches, bleach activators, and the like, may also be present. Commercial examples of detergents are well-known. Further examples are disclosed in U.S. 5,451,341 to White, issued September 19, 1995 and in U.S. Patents 5,288,431; 4,968,451; 4,597,898 and 4,515,705.

Stain Removal and Dry Cleaning/Refreshment Process - While the process of the present invention can be employed under any circumstances where stain removal from a fabric is desired, such as a spot removal step in a conventional aqueous laundering process as noted above, it is especially useful in a home dry cleaning and/or fabric refreshment process, as is described in more detail hereinafter.

As shown in Figure 1, the device and cleaning composition, optionally on a carrier, are first brought into close contact with the stain, e.g., by rocking or rolling the device on the stain, typically using hand pressure. Side-to-side rubbing with the device is preferably

avoided to minimize potential fiber damage. Contact is maintained for a period of 1-10 seconds for lighter stains and 1-5 minutes, or longer, for heavier or more persistent stains. In the "dual" process herein this is first conducted using the non-aqueous cleaning composition, and the process is then repeated using the aqueous cleaning composition.

- 5 After the stains are loosened in the described manner, the loosened stain matter and excess cleaning composition are optionally removed by gentle padding with a towel or tissue. The cationic dye fixative minimizes dye loss or transfer during this step.

- 10 The second step of the overall process is conveniently conducted in a tumbling apparatus, preferably in the presence of heat. In one convenient mode a nylon container bag with the carrier/aqueous cleaning composition and enveloping the pre-spotted fabric to be cleaned and refreshed is sealed and placed in the drum of an automatic hot air clothes dryer at temperatures of 40°C-150°C. The drum is allowed to revolve, which imparts a tumbling action to the bag and agitation of its contents concurrently with the tumbling. By virtue of this agitation, the fabrics come in contact with the carrier containing the cleaning composition. The tumbling and heating are carried out for a period of at least about 10 minutes, typically from about 20 minutes to about 60 minutes. This step can be conducted for longer or shorter periods, depending on such factors as the degree and type of soiling of the fabrics, the nature of the soils, the nature of the fabrics, the fabric load, the amount of heat applied, and the like, according to the needs of the user. In another mode, a sheet containing a high water content "refreshment" composition is used in place of the cleaning composition.

The following examples illustrate the present invention in more detail, but are not intended to be limiting thereof.

#### EXAMPLE I

- 25 A dry cleaning article in sheet form is assembled using a sheet substrate and an aqueous cleaning composition prepared by admixing the following ingredients.

	<u>Ingredient</u>	<u>% (wt.)</u>
	SANDOFIX TP	0.13
	PPP*	7.0
30	C <sub>12</sub> -C <sub>13</sub> EO (6.5)	0.25
	Perfume	0.50
	Water and minors**	Balance

\*Isomer mixture, available from Dow Chemical Co.

\*\*Includes preservatives such as KATHON®.

A non-linting carrier sheet is prepared using stock HYDRASPUN® Grade 10244 fabric, described above. The fabric is cut into square carrier sheets, approximately 9 in (22.9 cm) x 10 in (25.4 cm), i.e., 580.6 cm<sup>2</sup> sheets.

10-30 Grams of the above-noted cleaning composition are evenly applied to the sheet by spreading onto the sheet with a roller or spatula using hand pressure. In an alternate mode, the cleaning composition can be applied by dipping or spraying the composition onto the substrate, followed by squeezing with a roller or pair of nip rollers, i.e., by "dip-squeezing" or "spray squeezing". The external surfaces of the sheet are damp but not tacky to the touch. The finished sheet can be folded for packaging, and when unfolded and used in the manner disclosed herein, the sheet remains in the desired unfolded configuration.

Other useful aqueous cleaning compositions which can be used in like manner are as follows:

<u>Ingredient</u>	<u>Percent (wt.)</u>	<u>(Range)</u>
15 SANDOFIX TP	0.13	0.05-2.0%
Propoxy propoxy propanol (BPP)	7.000	4.0 - 25.0%
NEODOL 23 - 6.5*	0.250	0.05 - 2.5%
Water (distilled or deionized)	Balance	60.0 - 95.0%

Target pH = 7.0

20 \*Shell; C<sub>12</sub>-C<sub>13</sub> alcohol, ethoxylated with average EO of 6.5.

Besides the optional nonionic surfactants in the cleaning compositions herein, which are preferably C<sub>8</sub>-C<sub>18</sub> ethoxylated (E01-15) alcohols or the corresponding ethoxylated alkyl phenols, the compositions can contain enzymes to further enhance cleaning performance. Lipases, amylases and protease enzymes, or mixtures thereof, can be used. If used, such enzymes will typically comprise from about 0.001% to about 5%, preferably from about 0.01% to about 1%, by weight, of the composition. Commercial detergent enzymes such as LIPOLASE, ESPERASE, ALCALASE, SAVINASE and TERMAMYL (all ex. NOVO) and MAXATASE and RAPIDASE (ex. International Bio-Synthesis, Inc.) can be used.

30 The compositions herein can optionally be stabilized for storage using conventional preservatives such as KATHON® at a level of 0.0001%-1%, by weight.

A sheet of HYDRASPUN fabric, as described above, comprising 10-30 grams of a mixture comprising 9 parts PPP solvent and 1 part BP solvent, with no added water, is prepared separately.

35 A stained area on a fabric is treated in a dual pre-spotting step using the non-aqueous and aqueous compositions in the manner disclosed above.

Preferably, both steps are conducted using a tray device as depicted in Figure 1. The sheets can be marked, color-coded, or the like, to instruct the user regarding which sheet should be used first, and which should be used second. After the localized stains are substantially removed in this manner, the fabrics can be further cleaned in an automatic clothes dryer in the manner described hereinafter.

The pre-spotted fabric is then placed in a flexible bag (most preferably prepared from 1-3 mil nylon film) together with the sheet containing the aqueous cleaning composition. The bag is closed and sealed using a Velcro®-type fastener. Other fasteners such as nylon zipper and Zip-Lok®-type fasteners may also be used. In a typical mode, the bag will have a volume of about 25,000 cm<sup>3</sup>, which will accommodate up to about 2 kg of dry fabrics. When the fabrics and the cleaning sheet are placed in the bag, the air is preferably not squeezed out of the bag before closing and sealing. This allows the bag to billow, thereby providing sufficient space for the fabrics and cleaning sheet to tumble freely together. The bag is then closed, sealed and placed in a conventional hot-air clothes dryer. The dryer is started and the bag is tumbled for a period of 20-30 minutes at a dryer air temperature in the range from about 40°C to about 150°C. During this time, the sheet comes into close contact with the fabrics. After the machine cycle is complete, the bag and its contents are removed from the dryer, and the spent cleaning sheet is discarded. The nylon bag is retained for re-use. The fabrics are cleaned and refreshed. The water present in the cleaning composition serves to minimize wrinkles in the fabrics. Excellent overall cleaning is secured when from about 3 g to about 50 g of the preferred cleaning compositions herein are used per kilogram of fabric being cleaned.

#### EXAMPLE II

The following illustrates a typical dry cleaning kit herein, but is not intended to be limiting thereof.

A dry cleaning kit is assembled packaging a re-usable pre-spotting device as disclosed herein, multiple (typically, 5-10) single use dry cleaning articles comprising sheets releasably containing the non-aqueous cleaning composition and, separately, multiple (typically 5-10) sheets releasably containing the aqueous cleaning composition, all of the type described herein, together with a sealable, reusable heat-resistant (optionally vapor permeable) container bag, in a package comprising a conventional cardboard box suitable for retail sales. In an alternate mode, the articles may be in the form of spheres or polyhedra. In yet another mode, a reusable holding tray is provided in the kit for use as illustrated in Figure 1. In yet another mode, a portion (20-100 mls.) of aqueous cleaning composition containing the dye fixative is supplied in a bottle for direct application to stained areas of fabric. In still another mode, the kit may contain one or multiple (5-10)

single use fabric refreshment sheets as described in Example V, hereinafter, in addition to, or in place of, the dry cleaning sheets.

### EXAMPLE III

5 A sheet of HYDRASPUN fabric as described in Example I containing about 17 grams of a 9:1 mixture of PPP:BP is placed in a tray as shown in Figure 1. In a first step, a stained area of fabric is placed flat and in contact with the sheet. The device herein is placed in contact with the fabric and rocked back-and-forth, using hand pressure, until the stain is substantially removed. Side-to-side rubbing is avoided.

10 In a second step, the stained area of the fabric is placed over a sheet containing a water-based cleaning composition (containing Dye Fixative, as described above) and the treatment with the device herein is repeated.

After the stains are substantially removed, the fabric is placed together with a sheet containing an aqueous cleaning composition (again, as noted in any of the foregoing Examples), placed in a containment bag, and tumbled in a hot air clothes dryer.

15 In this mode, the containment bag is provided with a series of holes or vents to provide controlled release of vapors in the hot air clothes dryer, thereby minimizing wrinkling. Typically, 6 pairs of 2 mm diameter venting holes are punched in a 25000 cm<sup>3</sup> nylon bag and used herein. The amount of venting can be varied, e.g., from 6 pairs of 2 mm holes for 1X (23g) usage of the water-based cleaning composition up to 15 pairs of  
20 6 mm holes for 3X composition usage.

In an alternate mode, the first pre-spotting step of the process herein is conducted by directly pouring or spraying the aqueous cleaning composition comprising the Dye Fixative directly onto stained areas of the fabric. Optionally, but preferably, the fabric is then treated with the cleaning device herein. Alternately, the area of fabric is simply  
25 rubbed with a towel or paper towelette. The fabric is then further treated in the manner disclosed above.

### EXAMPLE IV

In an alternate mode, the HYDRASPUN fabric used in any of the foregoing Examples is replaced by an absorbent pad structure as described hereinabove as a  
30 "Controlled Release Carrier". Optionally, but preferably, the resulting pad is covered with an apertured formed-film coversheet, also as disclosed above. The resulting articles comprising the cleaning compositions herein, are used in the manner disclosed to clean fabrics. Refreshment articles, as described hereinafter, may also be covered with an apertured coversheet, if desired.

35

### EXAMPLE V

A fabric refreshment composition is prepared, as follows.

<u>Ingredient</u>	<u>% (wt.)</u>
Water	99.3
Surfactant (TWEEN 20)*	0.3
Perfume	0.4

5       \*Polyoxyethylene (20) sorbitan monolaurate available from ICI Surfactants.

23 Grams of the fabric refreshment product are applied to a 25 cm x 45 cm sheet of non-woven fabric. (Preferably, the sheet is of a type, size and absorbency that is not "dripping" wet from the liquid refreshment product.)

A multi-use portion of a pre-spotting composition is prepared, as follows.

10	<u>Ingredient</u>	<u>% (wt.)</u>
	PPP	7.00
	Neodol 23 (6.5)	0.25
	Sandofix TP	0.13
	Water	Balance

15       Step 1. A fabric to be cleaned and refreshed is selected. Localized stained areas of the fabric are treated by directly applying 2-5 mls. of the pre-spotting composition, which is gently worked into the fabric using the device herein. The treated stains are padded with dry paper toweling. In an alternate mode, the cleaning composition is releasably absorbed on a carrier sheet and applied to the stains.

20       Step 2. Following the pre-spotting step, the fabric is placed into a perforated nylon bag (as disclosed above) or, less preferably, vapor impermeable, together with the sheet releasably containing the fabric refreshment composition. The mouth of the bag is sealed, and the bag and its contents are placed in the drum of a conventional hot air clothes dryer. The dryer is operated in standard fashion for 20-60 minutes at an air temperature range of  
25       about 140-170°F (60-70°C). After the tumbling action of the dryer ceases, the cleaned and refreshed fabric is removed from the bag. The refreshment sheet is discarded.

#### EXAMPLE VI

30       A garment with no visible stains, but with malodors (e.g., smoking, body odor, food odor, and the like) is treated as follows. Step 1 of Example V is eliminated. The garment is treated in the manner disclosed in Step 2 of Example V in a hot air clothes dryer using the sheet containing the fabric refreshment composition. The malodors are thereby removed from the garment.

What is claimed is:

1. A composition of matter for cleaning fabrics, comprising:
  - (a) an organic cleaning solvent;
  - (b) a dye fixative;
  - 5 (c) optionally, a deterative surfactant; and
  - (d) water.
2. A composition according to Claim 1 wherein the organic cleaning solvent is an alkoxyated alkoxy propanol solvent.
- 10 3. A composition according to Claim 2 wherein the solvent is a member selected from the group consisting of propoxy propoxy propanol, butoxy propoxy propanol, and mixtures thereof.
- 15 4. A composition according to Claim 1 wherein the dye fixative is a cationic material.
5. A composition according to Claim 4 wherein the dye fixative is polycationic.
- 20 6. A composition according to Claim 1, comprising:
  - (a) from 4% to 25%, by weight, of propoxy propoxy propanol;
  - (b) from 0.05% to 2.0%, by weight, of cationic dye fixative;
  - (c) optionally, from 0.05% to 2.5%, by weight, of a nonionic surfactant which is an ethoxylated alcohol; and
  - 25 (d) the balance comprising an aqueous carrier.
7. A method for removing stains and soils from fabrics by contacting said fabrics with a composition according to Claim 1.
- 30 8. A method for removing stains and soils from fabrics by contacting said fabrics with a composition according to Claim 3.
9. A method for removing localized stains and soils from fabrics by contacting said fabrics with a composition according to Claim 6.
- 35

10. A method for removing stains from a stained area of fabrics, comprising the steps of:

- (a) applying a cleaning composition according to Claim 1 to said stained area;
- (b) concurrently or consecutively with Step (a), contacting the stained area of the fabrics with treatment means; and
- (c) applying compressive force to the treatment means.

11. A method according to Claim 10 wherein said treatment means are affixed to the convex treatment face of a hand-held device.

12. A method according to Claim 11 wherein the compressive force is applied using a rocking or rolling motion imparted to the device.

13. A method according to Claim 10 wherein the cleaning composition comprises a mixture of propoxy propoxy propanol, a dye fixative and water.

14. A method according to Claim 10 wherein the aqueous cleaning composition comprises water, propoxy propoxy propanol and a nonionic surfactant.

15. An overall dry cleaning process for cleaning and refreshing an entire area of fabric surface, which comprises a prespotting operation according to Claim 10 and comprising the overall steps of:

- (i) conducting a stain removal process according to steps (a)-(c) of Claim 10, on localized stained areas of fabric;
- (ii) placing the entire fabric from step (i) together with a carrier containing an aqueous cleaning or fabric refreshment composition in a containment bag;
- (iii) placing the bag in a device to provide agitation and agitating said bag; and
- (iv) removing the fabric from the bag.

16. A process according to Claim 15 wherein step (iii) is conducted in a hot air clothes dryer.

17. A process according to Claim 16 wherein the containment bag is vapor permeable.

18. A dry cleaning kit, comprising:



- (a) multiple, single-use sheets containing cleaning or fabric refreshment composition;
- (b) optionally, a liquid portion of a cleaning composition comprising a dye fixative;
- (c) a re-usable containment bag;
- (d) optionally, a re-usable holding tray; and
- 5 (e) optionally, a cleaning device.

19. An article for refreshing fabrics and removing malodors, comprising a liquid composition which comprises:

- (a) greater than 95% water;
  - 10 (b) from 0.05% to 1.5% of a perfume;
  - (c) from 0.05% to 2.0% of a surfactant;
  - (d) from 0% to 4.0% of a water-soluble low-molecular weight alcohol;
- said composition being releasably contained on a carrier sheet sufficient to hold 10 g to 100 g of said liquid composition without being dripping wet.

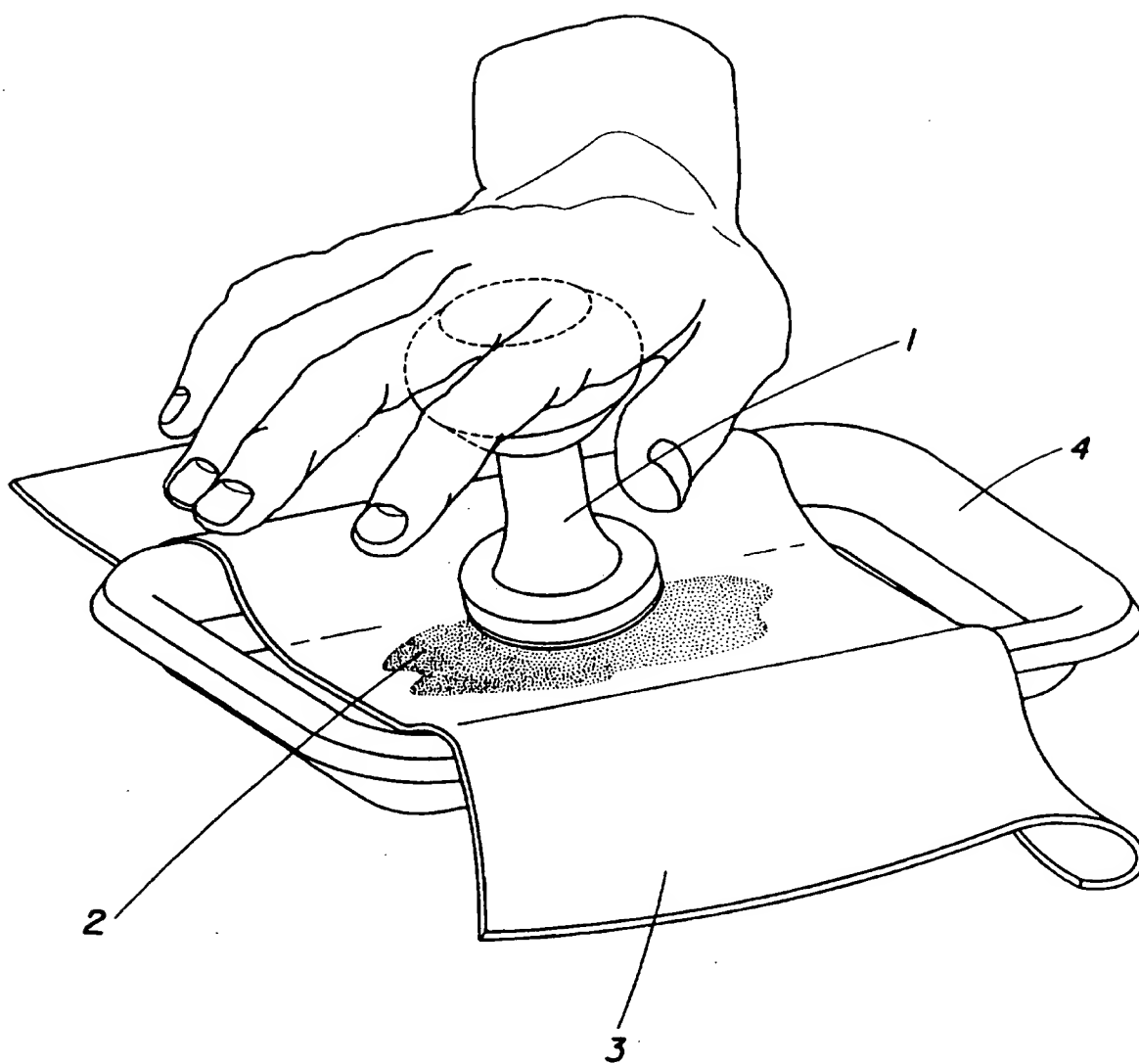
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20. An overall process for refreshing a fabric comprising the overall steps of:
- (i) placing the fabric together with the carrier containing the fabric refreshment composition according to Claim 19 in a containment bag;
  - (ii) placing the bag in a device to provide agitation and agitating said bag; and
  - 20 (iii) removing the fabric from the bag.

21. A process according to Claim 20 which is conducted in a hot air clothes dryer.

- 25 22. A process according to Claim 21 wherein the containment bag is vapor permeable.

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 97/06998

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 D06L1/04 C11D3/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 C11D D06L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 345 946 A (MILLIKEN RES CORP) 13 December 1989 see page 5, line 38 - line 57; claim 1 ---	1,7
A	EP 0 462 806 A (UNILEVER ) 27 December 1991 see page 3, line 2 - line 14; claims 9,10 ---	1,4,5,7
A	FR 2 502 143 A (KREUSSLER CHEM FAB) 24 September 1982 see claims ---	1,4
A	US 4 380 453 A (CLAIBORNE J LYLE) 19 April 1983 see the whole document ---	1,4,18
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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- \*Z\* document member of the same patent family

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# INTERNATIONAL SEARCH REPORT

International Application No

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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